

Cisco Office-in-a-Box Solution with Cisco Integrated Services Routers Generation 2, Cisco UCS E-Series Servers and VMware View



What You Will Learn

The modern workplace continues to evolve, with demands for improved mobility, new bring-your-own-device (BYOD) and VDI initiatives, and a need for an increasingly agile, productive and collaborative workforce. Deploying VDI at the branch or remote office has proven a challenge to most VDI adopters. Centralizing user desktops at the data center and having users access those desktops across the WAN results in poor user experience and WAN connectivity dependency for business continuity.

Cisco® Office-in-a-Box consists of the award-winning Cisco Integrated Services Routers Generation 2 (ISR G2) platforms (Cisco 2900 and 3900 Series ISRs) and the new Cisco UCS® E-Series Servers (Figure 1). With Cisco's best in class network technology combined with a powerful enterprise grade compute platform in a single box Cisco delivers a way to easily collapse branch office or retail store IT services into a single box. These services include VDI where the virtual desktops are hosted locally on the UCS-E server providing best user experience (LAN based connectivity) and no reliance on the WAN for business continuity. The Cisco UCS E-Series Server Modules are service modules that can be inserted into the Cisco ISR G2 platform and come in single- and double-wide sizes. The Cisco ISR G2 routers also deliver Cisco Cloud Connectors from Cisco and 3rd party vendors.

Figure 1. Cisco ISR G2 with Cisco UCS E-Series Server Modules



Small Office or Retail Store Challenges

Today's small office or retail store requires many different services to remain productive and relevant in the industry or marketplace. Typical services include desktop computing, routing and switching, voice services (private branch exchange [PBX]), point-of-sale (POS) applications, signage applications, and WAN acceleration. These services must run on multiple devices that take up space, consume power, and require separate management domains. The complexity of each separate system also often requires IT personnel onsite or on call. These challenges affect total cost of ownership (TCO) and operating expenses (OpEx), which the company must absorb.

Cisco Office-in-a-Box

The Cisco Office-in-a-Box solution provides a way to collapse all services that businesses require into a single box, resulting in easier management of services, a much smaller device footprint onsite (one box), and lower TCO. This is part of a multi-phased approach of Cisco's VDI Cloud connector strategy to address business continuity and end user experience.

Cisco Office-in-a-Box has three essential parts:

- The Cisco ISR G2 platform runs Cisco IOS® Software, which delivers an array of IT services such as network routing, IP PBX (Cisco Unified Communications Manager Express [Cisco Unified CME]), public-switched-telephone-network (PSTN) connectivity, WAN acceleration (Cisco Wide Area Application Services [WAAS]), remote access, Network Address Translation (NAT) and firewall, and Dynamic Host Configuration Protocol (DHCP).
- The Cisco UCS E-Series x86 server modules can be inserted into Cisco ISR G2 platforms (refer to the [Cisco UCS E-Series datasheet](#) for a platform compatibility matrix) and can deliver additional services. The Cisco UCS E-Series supports VMware ESXi 5.0, allowing you to virtualize multiple applications and services. One such service is the VMware Branch Office Desktop Solution. The Cisco UCS E160D server module can support up to 48 GB of memory, and it runs on a 6-core Intel processor with hyperthreading support, making it a 12-core server. Depending on the Cisco ISR G2 platform, you can insert more Cisco UCS E-Series modules if more computing power is necessary, either to expand the virtual desktop solution or to add applications such as video surveillance, digital signage, or a traffic counter.
- Cisco Cloud Connectors, embedded within Cisco IOS Software, or hosted on the Cisco ISR G2 compute blades, make it possible to take advantage of intelligent capabilities of the network to improve the delivery of cloud services and applications. Cisco Cloud Connectors help ensure that the network gains additional awareness of the cloud service, and allow them to dynamically respond to the conditions of the network. The improved linkage of the network with multiple cloud services contributes to increased transparency of the end-user experience and transparency of managing IT operations. Cisco offers cloud connector for cloud services offered by Cisco. In addition, partners are offering their own connectors leveraging Cisco Cloud Connector API.

The Cisco UCS E-series servers and the Cisco ISR G2 are built for enterprise grade performance with a service life expectancy longer than commercially available servers and routers. Also, the Cisco ISR G2 and Cisco UCS E-series solutions are covered under one Cisco SMARTnet services contract providing expert technical support, flexible hardware coverage, and smart, proactive device diagnostics. Your IT staff has anytime access to Cisco engineers in the Technical Assistance Center (TAC) and an extensive range of resources, tools and training.

Central Management for Virtual Desktops with Cisco Office-in-a-Box and VMware View

VMware View™ allows organizations to do more with less and adopt a truly user-centric and modern approach to computing in the branch office. By decoupling the applications, data, and operating system from the endpoint and by moving these components into the Cisco UCS E-Series Server, desktop and application virtualization offers IT a more streamlined, secure way to manage employees with agile desktop services that users can access on demand.

Using VMware View in conjunction with the Cisco Office-in-a-Box, IT departments can effectively move virtual desktop infrastructure closer to end users to optimize application response times and improve end-user performance. With this solution, IT can remotely manage, patch, and back up users in the branch office.

For information about the VMware Branch Office Desktop, see <http://www.vmware.com/solutions/desktop/remote-branch/remote-branch-office.html>.

Cisco UCS E-Series Servers

The Cisco UCS E-Series supports the Cisco Integrated Management Controller (IMC) to manage the server (BIOS, storage, monitoring, and IMC networking; see Figure 2).

Figure 2. Cisco Integrated Management Controller

The screenshot displays the Cisco Integrated Management Controller (IMC) web interface. The top navigation bar includes the Cisco logo and the text "Cisco Integrated Management Controller". The main content area is divided into several sections:

- Overall Server Status:** Shows a green checkmark and the word "Good".
- Server Summary:** Contains a list of actions such as "Power On Server", "Power Off Server", "Shut Down Server", "Power Cycle Server", "Hard Reset Server", "Launch KVM Console", "Lock Front Panel Power Button", and "Lock IOS Configuration Changes".
- Server Properties:** Lists details like Product Name (E160D), Serial Number (F0C16161F19), PID (UCS-E160D-M1/K9), UUID (1255F7F0-9918-0000-6484-484508FFFE2C), and BIOS Version (4.6.4.8).
- Server Status:** Shows "Power State: On", "Overall Server Status: Good", "Processors: Good", and "Memory: Good".
- Cisco Integrated Management Controller (CIMC) Information:** Provides details like Hostname (Unknown), IP Address (172.19.153.136), MAC Address (F0:F7:55:12:18:99), Firmware Version (1.0(1.20120808152414)), CPLD Version (4.4), Hardware Version (3), and Current Time (UTC) (Wed Sep 19 17:48:36 2012).
- Router Information:** Shows Router Model (C3945), Serial Number (FTX1419AK23), and Slot Number (4).

A left-hand navigation menu includes options like "Server", "Admin", "Summary", "Inventory", "Sensors", "System Event Log", "Remote Presence", "BIOS", "Power Policies", "Fault Summary", and "Host Image Mapping".

The Cisco IMC is the management service for the Cisco UCS E-Series Servers. You can use a web-based GUI or Secure Shell (SSH)-based command-line interface (CLI) to access, configure, administer, and monitor the server. This approach allows the administrator to access the server and configure, monitor, or upgrade firmware from a remote location.

For information about Cisco UCS E-Series administration, go to http://www.cisco.com/en/US/docs/unified_computing/ucs/e/1.0/guide/b_Getting_Started_Guide.html.

Cisco ISR G2

The Cisco ISR G2 uses the Cisco IOS Software CLI as the primary user interface for configuring, monitoring, and maintaining Cisco devices. This user interface allows you to directly and simply run Cisco IOS Software commands, whether you are using a router console or terminal or remote-access methods. However, for users not using Cisco IOS Software, the CLI can present a challenge. Alternatively, the administrator can use the Cisco Configuration Professional tool. Cisco Configuration Professional is a GUI device management tool for Cisco access routers. It simplifies router, firewall, intrusion prevention system (IPS), VPN, unified communications, WAN, and LAN configuration with easy-to-use wizards.

The tool also offers:

- One-click router lockdown
- Innovative voice and security auditing capability to check and recommend changes to the router configuration
- Router status monitoring
- Troubleshooting of WAN and VPN connectivity problems

Lower TCO with Cisco Configuration Professional

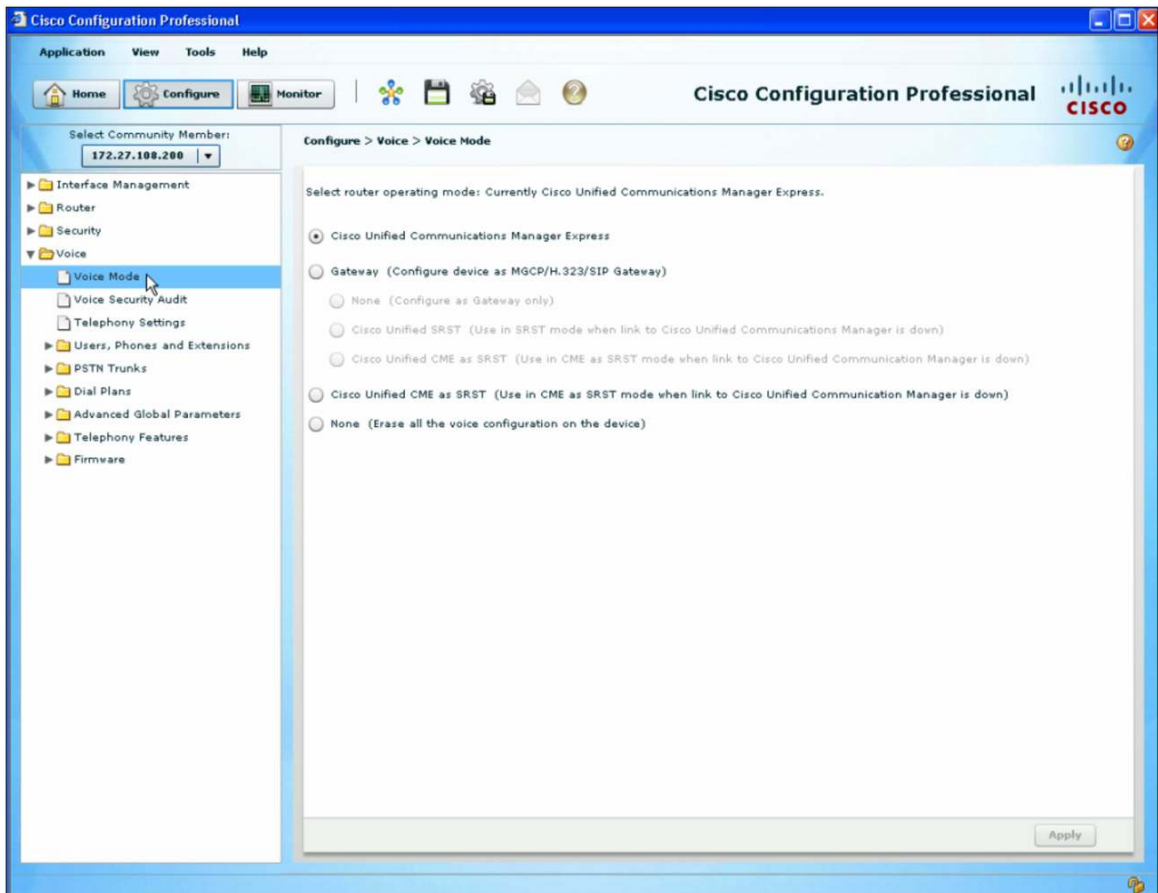
By relying on best-practices configurations approved by the Cisco Technical Assistance Center (TAC), customers can:

- Lower the TCO for Cisco routers
- Reduce human errors
- Simplify initial setup in voice deployments
- Help ensure proper linkage of users, dialing plans, and voicemail settings

Cisco Configuration Professional offers smart wizards and advanced configuration support for LAN and WAN interfaces, Network Address Translation (NAT), stateful and application firewall policy, IPS, IP Security (IPsec) and SSL VPN, QoS, and Cisco Network Admission Control (NAC) policy features. The firewall wizard allows a single-step deployment of high, medium, or low firewall policy settings. Cisco Configuration Professional also offers one-click router lockdown and an innovative security auditing capability to verify and recommend changes to router configurations based on Cisco TAC recommendations.

Cisco Configuration Professional allows IT managers to easily organize and manage multiple routers at a single site (Figure 3).

Figure 3. Cisco Configuration Professional



For more information about Cisco Configuration Professional, go to <http://www.cisco.com/en/US/products/ps9422/index.html>.

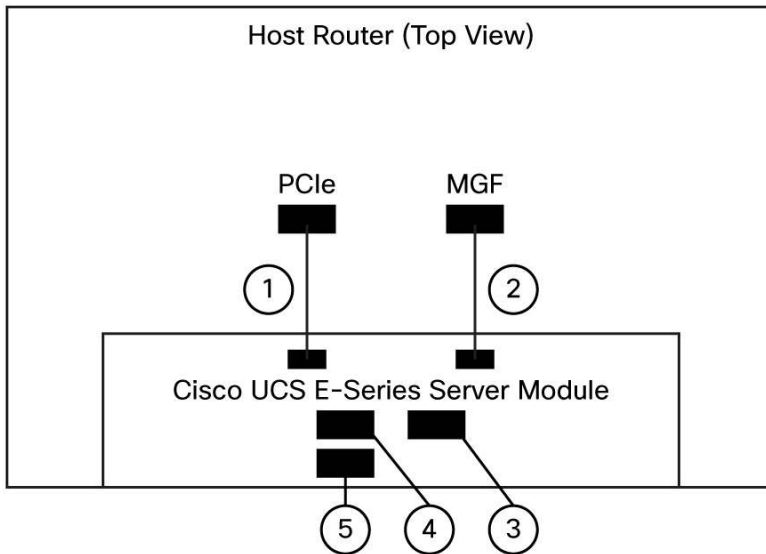
How Does Cisco Office-in-a-Box Work?

The Cisco UCS E-Series double-wide service modules support five Ethernet ports (Figure 4). The first two ports are internal to the backplane and connect the Cisco UCS E-Series Server and the router motherboard. Port 1, also called the console interface, connects the router's PCI Express (PCIe) interface to the Cisco UCS E-Series Server. The PCIe interface provides an internal Layer 3 Gigabit Ethernet link between the router and the Cisco UCS E-Series Server. Port 2 is a multigigabit fabric (MGF) interface; the MGF VLAN interface provides an internal Layer 2 Gigabit Ethernet link between the router and the Cisco UCS E-Series Server. Having two network connections from the Cisco UCS E-Series Server connect with the router delivers versatility in the treatment of virtual machine data traffic and makes it easy to implement network policies. The remaining three ports are accessible from the front panel of the Cisco UCS E-Series Server and do not send traffic through the router. Port 3 is a dedicated Fast Ethernet (10/100 Mbps) management port (Cisco IMC) that can be used only for accessing the Cisco IMC management tool (This interface is not exposed to the installed hypervisor.) Ports 4 and 5 are 1 Gigabit Ethernet interfaces that can be used as the primary interface or as a backup interface.

Access to Cisco IMC can be configured through any of the five ports using the Cisco IMC configuration tool. The installed hypervisor will be presented with four available network connections, giving the administrator the flexibility to choose the way that virtual machine data traffic traverses the network.

The Cisco ISR G2 platforms have two or three Layer 3 Gigabit Ethernet ports, which can be configured to access the various router services such as routing, Cisco Unified CME (IP PBX), firewall, WAN, and IPS. These ports also provide the network connection between Cisco UCS E-Series Server internal ports and the access network.

Figure 4. Interfaces in a Double-Wide Cisco UCS E-Series Server

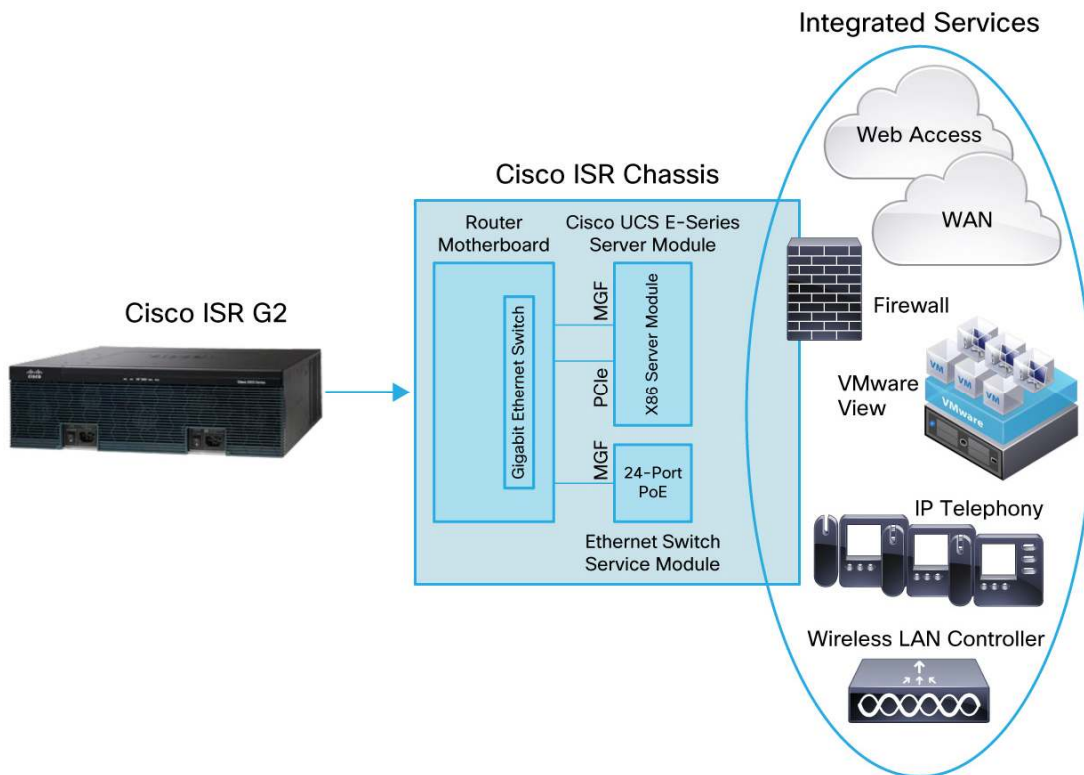


The Cisco UCS E-Series Servers have been validated by VMware for the VMware View Branch Office Desktop solution through the VMware Rapid Desktop Deployment Program, allowing easy deployment and configuration of a VMware View Branch Office Desktop solution and delivering the benefits and services of Cisco ISR G2 technologies within a single box. See the "Cisco Office-in-a-Box Technical Validation" section later in this document.

The Cisco ISR G2 platform supports Cisco Unified CME, which is an IP PBX application, and it supports Cisco IP phones and analog phones using Cisco analog voice WAN interface card (WIC) modules. For PSTN access, the Cisco ISR G2 platform supports a variety of PSTN-access voice WIC modules (T1 Primary Rate Interface [PRI], T1 channel associated signaling [CAS], foreign exchange office [FXO], and Basic Rate Interface [BRI]) and Session Initiation Protocol (SIP) trunking to SIP service providers. For more information, please visit <http://www.cisco.com/en/US/products/sw/voicesw/ps4625/index.html>.

Also, the Cisco ISR G2 platform supports Ethernet switch service modules (Cisco EtherSwitch® modules) that can be inserted into a service-module slot to provide network access to virtual desktop infrastructure (VDI) clients and other network devices such as IP phones. For more information, please visit http://www.cisco.com/en/US/prod/collateral/routers/ps10536/data_sheet_c78-553980_ps10537_Products_Data_Sheet.html.

Figure 5. Cisco Office-in-a-Box Solution



Platforms and Capacities

The Cisco Office-in-a-Box solution is targeted at the small office or retail store with no more than 15 to 30 users. The Cisco ISR G2 platforms are all based on the same technology and support the same features. You should choose the platform that supports the number of service modules and high-speed WAN interface card (HWIC) modules that you need. It also must support the service session capacity that you need: the number of supported voice-over-IP (VoIP) sessions, VPN sessions, or dynamic routing table entries. For information about the capabilities and scalability of the Cisco 3900 and 2900 Series ISRs, please visit:

- Cisco 3900 Series:
http://www.cisco.com/en/US/prod/collateral/routers/ps10536/data_sheet_c78_553924.html
- Cisco 2900 Series:
http://www.cisco.com/en/US/prod/collateral/routers/ps10537/data_sheet_c78_553896.html

For the Cisco UCS E-Series blades, the recommended module is the Cisco UCS E160D, which supports up to 48 GB of memory and comes with an Intel Xeon E5-2428L 1.8-GHz, 6-core processor with hyperthreading support.

Table 1 lists the specifications and configuration options for the Cisco UCS E-Series Servers.

Table 1. Cisco UCS E-Series Specifications and Configuration Options

Feature	Cisco UCS E140S (Single-Wide Blade)	Cisco UCS E140D, E140DP, E160D, and E160DP (Double-Wide Blades)
CPU	Intel Xeon E3 1105 C 1.0-GHz, 25W quad-core processor	Intel Xeon E5-2418L 2.0-GHz quad-core processor Intel Xeon E5-2428L 1.8-GHz 6-core processor
DRAM	8 GB (default: one 8-GB dual inline memory module [DIMM]) and up to 16 GB (two 8-GB DIMMs)	8 GB (default) and up to 48 GB (three 16-GB DIMMs)
Hard-disk drive (HDD)	Up to two: <ul style="list-style-type: none"> • 7200-rpm SATA: 1 TB • 10,000-rpm SAS: 900 GB • 10,000-rpm SAS SED: 600 GB • SAS SSD SLC: 200 GB 	Up to three (Cisco UCS E140D or E160D) or two (Cisco UCS E140DP or E160DP): <ul style="list-style-type: none"> • 7200-rpm SATA: 1 TB • 10,000-rpm SAS: 900 GB • 10,000-rpm SAS SED: 600 GB • SAS SSD SLC: 200 GB
RAID options	<ul style="list-style-type: none"> • Hardware RAID 0 and 1 • LSI MegaRAID controller 	<ul style="list-style-type: none"> • Cisco UCS E140D and E160D: Hardware RAID 0, 1, and 5 • Cisco UCS E140DP and E160DP: Hardware RAID 0 and 1 • LSI MegaRAID controller
Network interface cards (NICs)	Two internal and one external Gigabit Ethernet ports	Two internal and two external Gigabit Ethernet ports
Supported Cisco ISRs	Cisco 2911, 2921, 2951, 3925, 3925E, 3945, and 3945E	<ul style="list-style-type: none"> • Cisco UCS E140D and E140DP: Cisco 2921, 2951, 3925, 3925E, 3945, and 3945E • Cisco UCS E160DP and E160DP: Cisco 3925, 3925E, 3945, and 3945E
PCIe	None	Cisco UCS E140DP and E160DP: Four 1 Gigabit Ethernet or one 10 Gigabit Ethernet and Fibre Channel over Ethernet (FCoE)
Cisco IMC	<ul style="list-style-type: none"> • Integrated Emulex Pilot-3 baseboard management controller (BMC) • Intelligent Platform Management Interface (IPMI) 2.0 compliant for management and control • One 10/100 Ethernet out-of-band management interface • CLI and WebGUI management tool for automated, lights-out management • Keyboard, video, and mouse (KVM) 	<ul style="list-style-type: none"> • Integrated Emulex Pilot-3 BMC • IPMI 2.0 compliant for management and control • One 10/100 Ethernet out-of-band management interface • CLI and WebGUI management tool for automated, lights-out management • KVM
Secure Digital (SD) cards	Two SD cards: One for the Cisco IMC and temporary storage of OS and hypervisor installation images, and one for a blank virtual drive on which you can install an OS or a hypervisor	Two SD cards: One for the Cisco IMC and temporary storage of OS and hypervisor installation images, and one for a blank virtual drive on which you can install an OS or a hypervisor
Front-panel connectors	One KVM console connector (provides 2 USB, 1 VGA, and 1 serial connector)	Front-panel VGA, 2 USB, and serial console connectors

Conclusion

The Cisco Office-in-a-Box solution with VMware ESXi 5.0 and VMware View delivers an easy-to-deploy branch-office desktop solution that saves OpEx, TCO, and space. By converging all IT services in a single box, the small office or retail store also saves on energy consumption and becomes simpler to manage.

Appendix: Cisco Office-in-a-Box Technical Validation

Overview

This validation was performed at VMware labs to illustrate how a single Cisco UCS E160D blade can be configured to host the infrastructure and virtual desktop components necessary to support the office-in-a-box initiative.

This design also applies to a deployment of up to 50 desktops in a branch- or remote-office scenario.

To balance performance with density, the infrastructure services have been configured with the minimum requirements to support a deployment of no more than 50 virtual desktops.

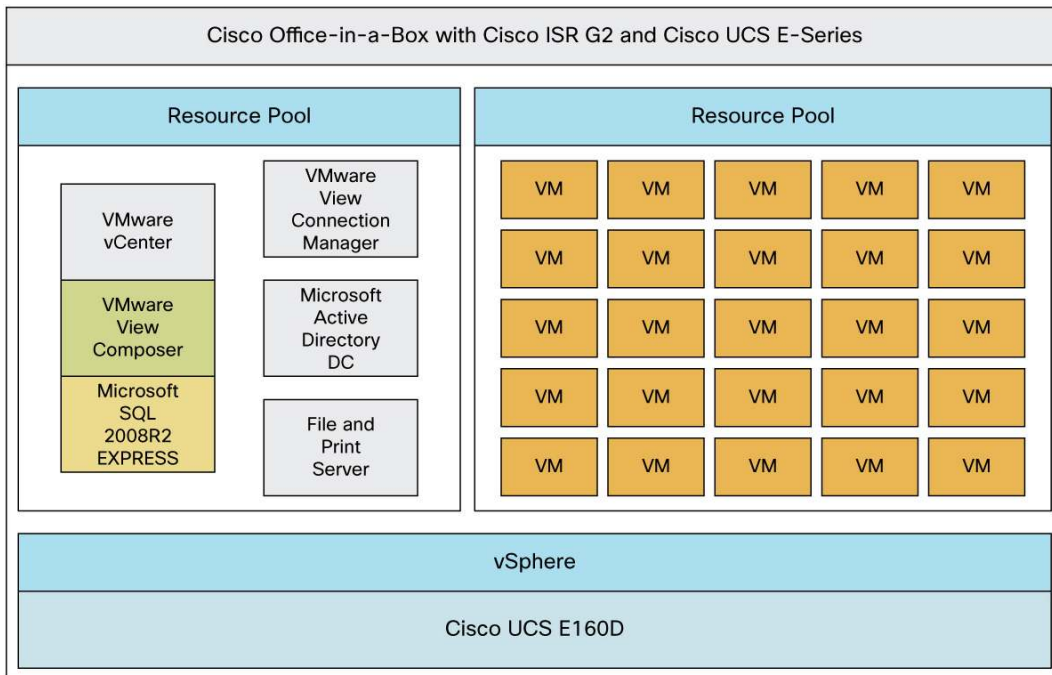
For the validated design, 25 virtual desktops were deployed and tested with a high-use knowledge worker profile.

As part of the validated design, VMware Mirage can be used with the VMware Branch Reflector capability, and this virtual machine can also be hosted on the Cisco UCS E-Series Server with the overhead of a single virtual desktop virtual machine.

Virtual Infrastructure

All infrastructure and desktop virtual machines were hosted on a single Cisco UCS E160D blade (Figure 6).

Figure 6. Logical Design



All virtual machines share the direct-attached storage (DAS) of the Cisco UCS E-Series blade.

Note that fault tolerance was not considered in this validated design.

Resource pools were created in VMware vSphere to isolate and help guarantee resources to both the infrastructure and desktop virtual machines.

Virtual Machines

Table 2 shows the virtual machine roles and virtual hardware configuration for both sites.

Table 2. Virtual Machine Roles and Configuration

Virtual Machine Role	Virtual Machine Specification	Notes
Microsoft Active Directory Domain Controller	1 virtual CPU (vCPU) with 4096 MB of RAM and Microsoft Windows Server 2008 R2 64-Bit Standard Edition	Microsoft Active Directory domain controller 1

Virtual Machine Role	Virtual Machine Specification	Notes
VMware vCenter VMware View Composer Microsoft SQL Server 2008 R2 Express	2 vCPUs with 4096 MB of RAM and Microsoft Windows Server 2008 R2 64-Bit Standard Edition	VMware vCenter and Composer and Microsoft SQL services
View Connection Manager	2 vCPUs with 4096 MB of RAM and Microsoft Windows Server 2008 R2 64-Bit Standard Edition	VMware View Connection Manager 1
File and print server	1 vCPU with 4096 MB of RAM and Microsoft Windows Server 2008 R2 64-Bit Standard Edition	Persona management Common Internet File System (CIFS) repository
Virtual desktop	1 vCPU with 1024 MB of RAM and Microsoft Windows 7 32-Bit Enterprise Edition	Virtual desktop virtual machine or VMware Mirage Branch Reflector virtual machine

A single desktop pool of 25 virtual machines was provisioned as part of the testing.

The desktop pools were configured to be nonpersistent and to refresh at logoff.

Performance Data

Figures 7, 8, and 9 show performance data from a 25-virtual machine knowledge worker profile run with five iterations during a 4-hour time period.

Figure 7 shows CPU use, Figure 8 shows memory use, and Figure 9 shows data store I/O operations per second (IOPS) for the selected period.

Figure 7. CPU Utilization (in GHz)

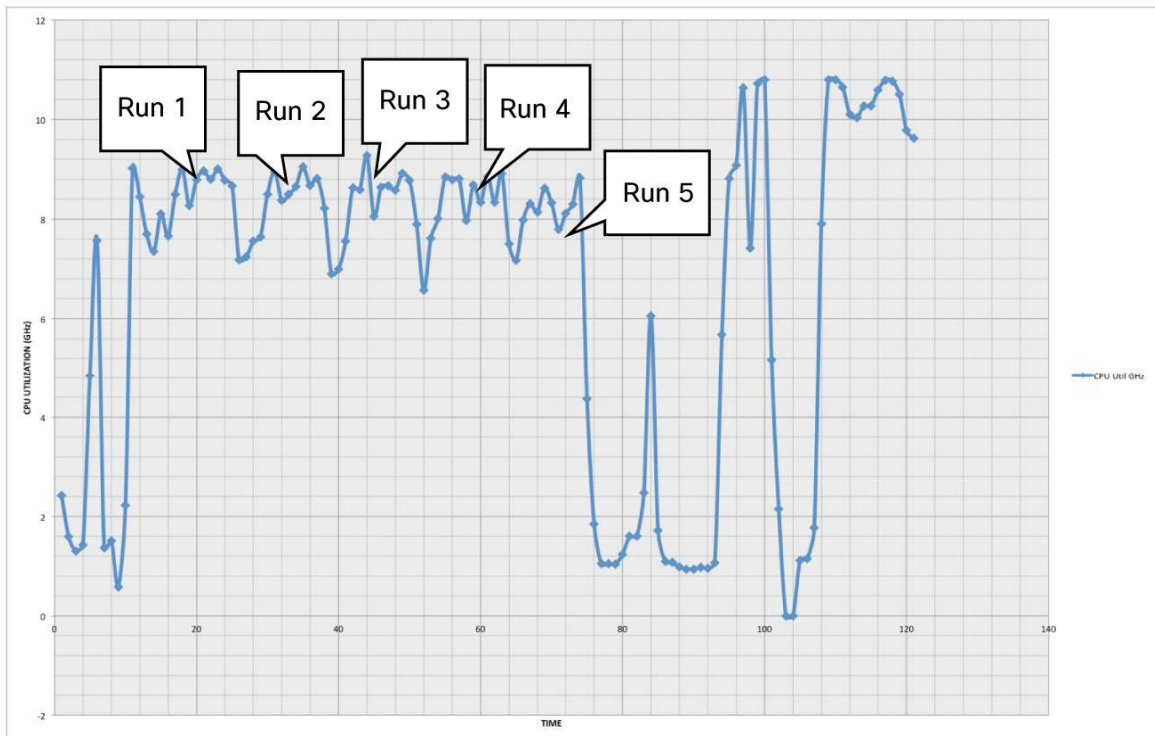


Figure 8. Memory Utilization (in GB)

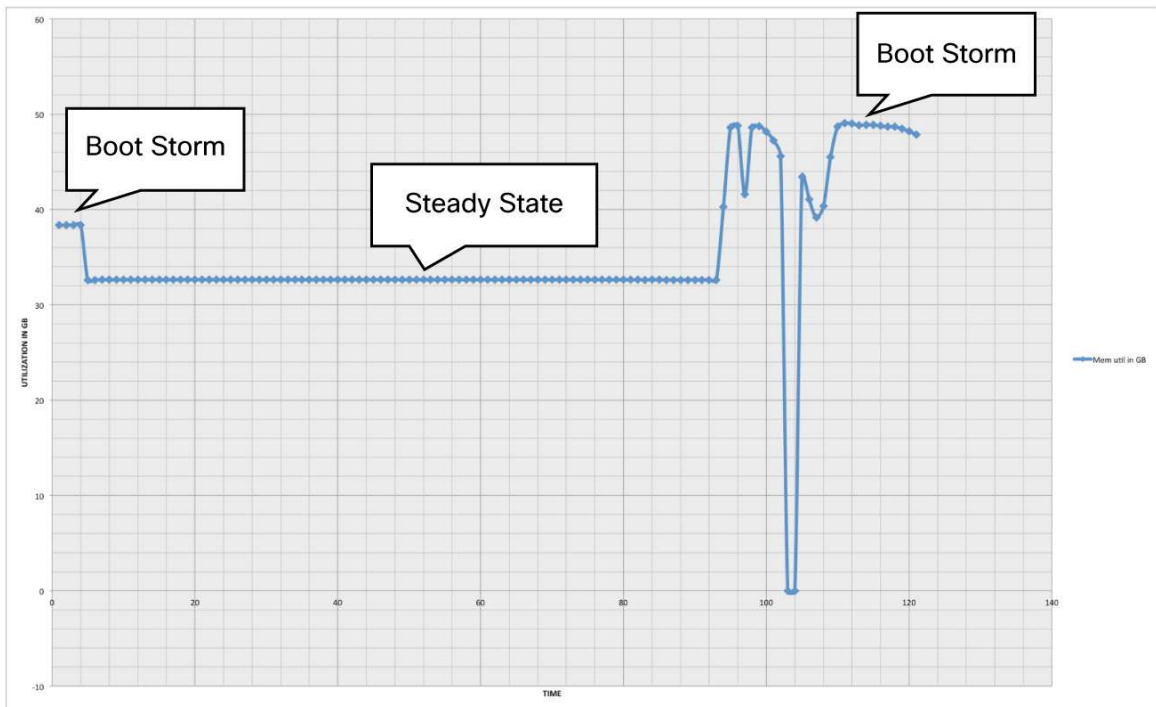
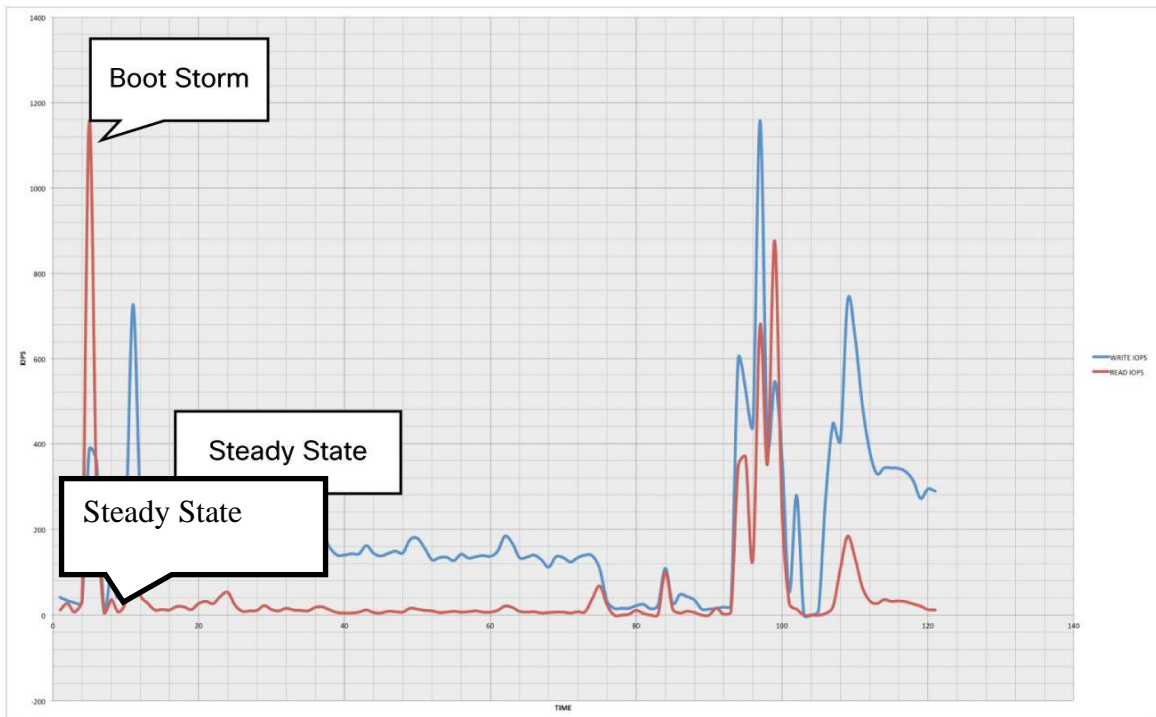


Figure 9. Data Store IOPS



Note: VMware View Storage Accelerator was used in the testing.

References

Cisco UCS-E admin guides:

- [Getting Started Guide for Cisco UCS E-Series Servers, Release 1.0](#)
- [Hardware Installation Guide for Cisco UCS E-Series Servers](#)
- [GUI Configuration Guide for Cisco UCS E-Series Server Modules Integrated Management Controller, Release 1.0](#)
- [Troubleshooting Guide for Cisco UCS E-Series Servers](#)

Cisco ISR G2 admin guides:

- http://www.cisco.com/en/US/products/ps10906/Products_Sub_Category_Home.html
- [Readme First for Cisco Configuration Professional](#)
- [Cisco Configuration Professional Quick Start Guide](#)
- [Cisco Configuration Professional Express 2.7 Administration Guide](#)
- [Cisco Configuration Professional Express 2.7 User's Guide](#)
- [Basic Router Configuration Using Cisco Configuration Professional](#)

Cisco Cloud Connectors:

- http://www.cisco.com/en/US/prod/collateral/routers/ps10536/white_paper_c11-706801.html



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